A new microscopic toolbox harnessing the forces of light - a tribute to the 2018 Nobel Prize in physics

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Publication date:
2019

Document Version
Publisher's PDF, also known as Version of record

A new microscopic toolbox harnessing the forces of light

- a tribute to the 2018 Nobel Prize in physics

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The 2018 Nobel Prize in Physics was awarded "for groundbreaking inventions in the field of laser physics", with one half going to Arthur Ashkin "for the optical tweezers and their application to biological systems". Since Arthur Ashkin's initial demonstration of optical trapping in 1970, harnessing the forces of light has facilitated unprecedented precision for microscale manipulation, with applications spanning numerous areas of natural sciences.

Light Robotics[1] emerged in the past decade as a research area due to the synergistic exploitation of optical manipulation and novel microfabrication techniques. A rapidly growing area, Light Robotics aims at becoming a microscopic toolbox for manipulation and actuation, a "Jack of all trades" for research at the microscale. The already reported uses of Light Robotics microtools include surface scanning probes,[2] material transport,[3] indirect cellular manipulation[4] and thermoplasmonic mixing.[5]

The development of the Light Robotics toolbox involves the design, fabrication and functionalization of application-specific microtools, combined with beam-shaping and intelligent control of the optical traps. BioBots, microtools amenable to optical trapping and manipulation in biological samples, are currently being investigated by our group in an effort to expand the applications of Light Robotics. This new microscopic toolbox is meant to help promote our understanding of a wide range of microscale phenomena.

1 Glückstad, J. and Palima, D. (Elsevier, **2017**)
2 Phillips, D. B. *et al. Opt. Express* 20, 29679–29693 (**2012**)
3 Villangca, M. J. *et al. Light Sci. Appl.* 5, e16148 (**2016**)
4 Aekbote, B. L. *et al. Biomed. Opt. Express* 7, 45–56 (**2016**)
5 Engay, E. *et al. Opt. Lett.* 43, 3870–3873 (**2018**)